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TECHNICAL PROPOSAL

CUSTOMER-REQUESTED MODIFICATIONS OF SYSTEM 4 AND ASSOCIATED DATA-REDUCTION EQUIPMENTS

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1. Introduction

System and field experience with System 4 and its associated ground data-handling equipment has indicated the desirability of incorporating certain improvements in equipment capabilities. These improvements have been discussed with customer representatives, who have requested that a modification proposal be submitted. The modifications covered by this proposal are:

(1) provision for antenna switching in Bands 1A and 1B receiving equipments

(2) provision for minimizing degradation of AGC information incurred in the ground duplicating process

(3) provision for positive indication of photo number.

2. Antenna Switching for Bands 1A and 1B

a. The present System 4 design provides for simultaneous operation of Bands 1A and 1B receivers from two 17-inch spiral antennas. The antenna outputs are applied to a multi-coupler which provides separate outputs for the right and left antennas in the range of 150 to 300 mc. These outputs are applied to separate distributed amplifiers, and the output signals from the distributed amplifiers are then summed and applied to the parallel input circuits of the Bands 1A and 1B receivers. Thus, no provision is made for distinguishing between right- and left-antenna signal intercepts.

b. A requirement has been established, however, for identification of right and left antenna signals, similar to that provided in the Bands 2 through 7 receivers. This change requires the addition of coax switching relays to the receiver input circuits, and auxiliary control circuits in the programmer and the system rack. The right-left indication signal for

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Bands 1A and 1B will be added to the auxiliary-data digital word recorded on track 12 of the magnetic tape.

c. In the ground data-handling equipment, additional circuitry will be required in the Auxiliary-Data Display ("M") Equipment to handle the two additional binary bits providing right-left indication for Bands 1A and 1B.

d. Wiring and switching circuit changes will be required also in the System 4 test set to provide for indication of the additional binary bits.

3. AGC Recording and Processing

a. The AGC data obtained from the eight superheterodyne receiving equipments in the present design are recorded by amplitude modulating a separate tone carrier for each receiving channel. During duplicating operations in the ground data-handling equipment, degradation of AGC information occurs as a result of "tape wander" and non-uniformity of the magnetic tape coating. To minimize this degradation, it is proposed that frequency modulation rather than amplitude modulation of the AGC tone carriers be employed.

b. The changes required to effect this modification in the airborne equipment are relatively simple, involving primarily the modulation circuitry in the audio programmer. In the ground data-handling equipment, changes will be required in both the Auxiliary-Data Display ("M") and AGC Separator ("N") Equipments. In the latter equipment, changes will be required in both the demodulation and modulation circuits. The "M" equipment will require circuit changes to accommodate the frequency-modulated AGC information.

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c. In the present design of the system test set, operation of the AGC tone channels is checked by direct display of the filtered tone output on an oscilloscope. With f-m recording, it will be necessary to add a discriminator for each of the AGC tone channels and to provide a selector switch and meter for measuring the frequency deviation of each channel.

4. Provision for Positive Film-Count Indication

a. The present method for identifying the photo number involves a cumulative count, during ground data processing, of tone bursts recorded on the master tape. Tests have shown that ambiguities may occur, and for this reason it is desirable to incorporate provisions for a more positive film-count indication.

b. The proposed modification will provide for recording on the master tape a digital word which identifies the number of the photograph being taken. The proposed modification involves a minimum number of changes in the airborne equipment, although more extensive changes will be required in the ground data-handling equipment. In the airborne system a counter will be added which advances one step each time a sequence of four pictures is taken. Each time a picture sequence occurs, the digital data track will be made available for recording this count on the tape. In the interest of equipment conservation, the existing shift registers will be used for storage and read-out of the new digital word. When a photo number is to be recorded, the shift registers are not used in their normal function of processing the auxiliary-data

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digital word. Although the information content of the digital data is increased, this will not cause degradation of data in normal operation, since the high data-sampling rate used provides sufficient redundancy to accommodate the added information and still indicate the status of the rapidly changing circuits with the same accuracy as before.

c. Modification to the ground data-handling equipment would be accomplished primarily in the Auxiliary-Data Display ("M") Equipment. Circuit changes will be required primarily in the shift-register readout units. Additional logic circuitry will be required to handle the program switching, the added function control, and to accept, retain, and read out the photo number. Mechanical changes will be required in the "M" equipment to handle the additional circuitry, and additional cabling will be required in the "M" unit and other units of the data-reduction system.

d. Additional circuitry is required in the system test set for checkout of the photo number circuits of a nature similar to that developed for the ground data-handling equipment. However, the additional modules will require the design and construction of another chassis for the test set.

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